COLORADO PLATEAU Advocate

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GRAND CANYON TRUST

Michael Collier

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Discovering Connections

Scientists from the National Oceanic and Atmospheric Administration (NOAA) recently reconstructed annual flows in the Colorado River since the 1550s. They used a century of stream gauge measurements on the Green, San Juan, and Colorado rivers to calibrate a veritable library of tree-ring measurements, giving an accurate view deeper into the past. The comprehensive results confirm familiar earlier findings that the 2000 to 2004 drought was a bad one, but hardly unprecedented; and that the early 20th century, when the Colorado's water was divvied up among the western states, was the wettest period in centuries. We now know for sure that the river is over-allocated and that we had better brace ourselves for big droughts to come. Underscoring the growing sophistication of climate modeling, the researchers note that drought in the Colorado's watershed is strongly associated with sea surface temperature variations in the North Atlantic, North Pacific, and Indian oceans, teaching us again John Muir's realism in writing "When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

Certainly the Colorado Plateau is widely hitched up to everything around it. The high, dry land is an edgy place—a land of thin margins where even small changes can cascade surprisingly. In this issue of the *Advocate*, Mary O'Brien highlights the remarkable diversity of life that has matched itself over eons to the remarkable diversity of habitats on the Plateau. Among much else, she describes research showing how a heavily visited canyon in Zion National Park is losing its stream banks compared with a backcountry canyon, not primarily through trampling under hikers' boots, but because cougars avoid the populous areas allowing deer to proliferate and browse the protective streamside groves of young cottonwoods to a nub. Few things are as straightforward as they seem.

Like seeps that may harbor alcove rock daisies and maidenhair ferns in a miniature wetland, the forested highlands of the canyon country are vulnerable oases in a fundamentally desert climate. Change the water

Bill Hedden

supply and all bets are off, yet the NOAA researchers remind us that the water supply is ultimately caught up in the global greenhouse gas experiment we humans are performing. Ethan Aumack explains in these pages how global factors also interact with more localized changes. Forest health has declined from a century of fire suppression, overgrazing, and logging, resulting in the unnatural dog-hair thickets of small trees that can light up into a conflagration under the right conditions of weather and climate. So, last year's extraordinarily dry winter on the Kaibab Plateau north of the Grand Canyon was followed this summer by the forest's biggest fire in recorded history. Drought and fine fuels made an unstoppable combination when the wind began to blow. We have yet to discover the ecological costs and benefits of the alarming burn, but look for them to be complex.

If the Kaibab fire exemplifies the localized result of vast converging forces, like light passing through a magnifying glass, Laura Kamala's story about mercury pollution reveals how ostensibly local waste emissions can spread their effects across entire regions. Mercury from our coal-fired power plants, industrial boilers, burning dumps, and gold mills is literally raining down on us and coming right back up the food chain as toxic methylmercury. Fish in the most pristine areas are loaded with the stuff, as are wildfowl on the Great Salt Lake. In the East, where the problem has been studied longer, scientists have found high mercury levels in most insect-eating songbirds because it is incorporated in forest duff consumed by the bugs. Those birds with the most mercury are experiencing the biggest population declines, leading me to thoughts of canaries in the coal mine.

Change on the scale needed won't be easy unless we truly appreciate where we are heading now. Roger Clark's article spells out the consequences of our reliance on coal-fired energy to give a sense of the imperative need for large-scale investments in cleaner power, and Tony Skrelunas tells how this message is being heard among long-term residents of the Plateau in the Navajo community of Shonto. Staff attorney Kristin Carden describes the nationwide effort to compel the Environmental Protection Agency to recognize and regulate greenhouse gasses as pollutants, and Flagstaff writer Rose Houk digs into the promise and some of the problems attending production of renewable energy.

Scientists and environmentalists who point out these webs of interactions have learned that it is not a popular thing to do. It seems so gloomy and alarming. But, if we cannot escape the consequences of our actions in this interconnected world, then it matters very much *how* we act. And, if our actions matter so much, might we not hope that our good actions will be magnified in wonderful ways throughout the world-system? Hopeful initiatives may trigger positive feedback in the resilient, self-balancing earth, and hopeful actions can certainly inspire other people to take even more creative steps of their own invention. In the 21st century we badly need hope to be as infectious as fear has been.

Tinkering with Tomorrow?

by Roger Clark

"…fossil energy is the worst discovery man ever made, and his disruption of the carbon-oxygen cycle is the greatest of his triumphs over nature. Through thinner and thinner air we labor toward our last end, conquerors finally of even the earth chemistry that created us."

—Wallace Stegner, 1969, *Conservation Equals Survival*

Water is central to all Hopi ceremonies. Their creation story teaches that only water existed at the dawn of time and that water is the source of all life. It is, in fact, sacred to those who've learned how to live for generations where it's scarce. Hopi children learn that without it, nothing survives. They know that water has the power to destroy everything.

Global weather patterns are changing, altering the distribution of precipitation around our planet. Entire communities of life are threatened or endangered. Ice sheets that existed for hundreds of thousands of years are melting. Oceans are less salty and warming. Coral reefs are bleaching. The atmosphere is becoming energized with high-octane water vapor, and storms are strengthening.

The Colorado Plateau is also experiencing extreme weather-related events: severe drought and localized flooding, dying forests, devastating wildfires, declining snow packs, evaporating lakes, and disappearing springs. Hopi prophesies warn that such events foretell a world out of balance, a time of transition when wisdom wrought from experience is essential to guide us into tomorrow.

Life on the Edge

Life on earth exists within a fragile and finite biosphere, a few shreds of fabric scarcely thicker than the 20-mile width of the Grand Canyon. Our one-and-only spacesuit fits snugly. Without it, we perish. Life has been to that brink and nearly extinguished more than once during geologic time.

Michael Melford/National Geographic Image Collection

Grand Canyon rocks tell compelling stories. The rim of Kaibab limestone, for instance, speaks of a time 250 million years ago when more than 95 percent of all marine life went extinct. The ancient fossilized seabed, now perched at 7,000 feet above sea level, provides ample evidence of global warming caused by massive volcanic eruptions that filled our atmosphere with carbon dioxide.

Ocean temperatures increased and disrupted salinity-driven currents. The events trapped oxygen and nutrients deeply below the surface, killed sea life, and destroyed the ocean's ability to absorb excess carbon dioxide from the atmosphere. Terrestrial vertebrates and even insects were decimated, leaving mostly fungi to carry on life for eons.

"Tinkering with the atmosphere, we change the ocean's chemistry radically enough to threaten life on earth as we know it," observed oceanographer Julia Whitty. Her haunting words walked with me along the Canyon's rim last fall, watching remnants of sea life skim beneath my feet.

Places Worth Saving

The cover photo on the October 2006 *National Geographic* features Lake Powell's luscious red-rock landscape juxtaposed with the towering smokestacks of Navajo Generating Station (NGS). "Places We Must Save" reads the caption in reference to "world parks at risk."

The plant's pollution plume continues to obscure scenic vistas at Grand Canyon and other national parks nearby, particularly when certain weather patterns prevail. During the 15 years since the Grand Canyon Trust negotiated a historic agreement to reduce sulfur dioxide emissions at NGS, we've learned that protecting visibility in national parks is an important step toward considering an even bigger challenge—addressing long-term problems caused by burning coal and other fossil fuels.

"We're using the atmosphere as our sewer," warned climatologist Henry Pollack at a conference on global warming, hosted by the University of Utah's Stegner Center. For nearly a century, coal-fired power plants have been pumping billions of tons of toxins into our thinly stretched bubble of breathable air.

Navajo Generating Station, for example, produces about one-fifth of all Arizona's greenhouse gasses. It is the state's largest single source of carbon dioxide, emitting nearly 20 million tons annually. It is a major source of mercury and nitrogen pollution. It also consumes 32,000 acre-feet of water per year, more than three times the amount used annually by 60,000 residents of Flagstaff, Arizona.

Our future is tied to it and to hundreds of similar facilities in operation or being planned around the world. They pose threats and yet persist, testifying to the difficulties we face in saving the places we care about and in passing on a livable planet to our children.

Coal Rules

Coal mines and power plants secure healthy profits by seducing us with such convenience that we happily assume all the risk. "We must keep the lights on," utility executives are fond of warning. But at what cost and at whose expense?

Our taxes help to subsidize capital expenses for utilities and to fund research on "clean coal" technology. Corporation and public utility commissions grant cost recovery from rate payers for rising operational expenses. We underwrite inefficient systems and nurture "business-as-usual." We virtually guarantee freedom from oversight and regulation.

The Navajo and Four Corners power plants, two of the West's largest and dirtiest coal-fired power plants, have been running for more than six years without emission standards set by the Environmental Protection Agency (EPA) for operating within the law. It's as if police repealed speed limits and took an extended vacation.

"Sue us so I can do my job," pleaded a high-ranking EPA official. "My boss doesn't believe that enforcing the Clean Air Act is a priority," he added, driving home a sad reality about this administration.

Mercury is one of the coal industry's more lasting, and lethal, legacies. Electrical power plants are the largest source of human-caused mercury pollution in the world. "Mercury contamination caused by emissions from coal-burning power plants is a serious, growing problem for Arizona and across the country," warned the director of Arizona's Department of Environmental Quality.

Unlike all other businesses in the United States, mercury pollution from power plants remains totally unregulated. Yet it accounts for unhealthy concentra-

tions found in streams and reservoirs and alarmingly high rates in fresh and saltwater fish. In November, the American Medical Association adopted a new policy calling for the U.S. government to become a leader in reducing harmful mercury emissions. It strongly objected to the Bush administration's proposal to phase in a voluntary pollution trading system for this neurotoxin that has been linked to autism and birth defects. If large polluters buy extra mercury credits, local populations may be legally poisoned.

Energy and Water

Freedom from regulation has been accompanied by powerful economic forces and given additional momentum to perpetuating our dependence on coal. The construction of Lake Powell and Navajo Generating Station set the stage for Arizona's record development and economic growth. Abundant water and energy are key assumptions to sustaining this growth.

Planners thought that Lake Powell would remain near its capacity after filling in 1980. But with a succession of drought years, the reservoir has dropped to less than half capacity, lower than anyone ever anticipated. The system needed to siphon water from the reservoir to supply Navajo Generating Station was poorly designed. Therefore, they've recently had to extend the pipeline because the demand for water is now exceeding the river's ability to supply it.

The 2,250-megawatt generating station was developed in cooperation with the U.S. Bureau of Reclamation to supply electricity needed to pump water uphill from the Colorado River to Phoenix and Tucson. It was sited next to Lake Powell because an enormous amount of water is needed to cool its machinery and to turn its turbines.

More than 65 percent of the energy produced in NGS boilers is wasted as super-heated flue gas that billows into the air from its three 700-foot-tall chimneys. Another 10 percent of its energy is lost as electricity is transmitted through high-voltage lines to the Central Arizona Project (CAP). CAP pumps are Arizona's largest single consumer of electricity, using nearly one-fourth of the total electricity produced by the plant.

It took 50 years from inception to completion of CAP, the world's largest water diversion project. Federal taxpayers financed the project's $4.5 billion construction cost for a 336-mile-long canal and 15 pumps. About half the total cost is being repaid through the sale of electricity from Navajo Generating Station.

Once 1.5 million acre-feet of water are pumped into the uncovered canal and reservoirs, more than 50,000 acre-feet evaporate into the hot desert air. CAP water is currently too expensive for most agricultural and residential uses, when compared to the unsustainable practice of pumping fossil groundwater. Therefore, much of CAP's water that has been lifted more than 3,000 feet is used to recharge those underground aquifers, requiring yet more electricity to pump it back into the ground.

Water and energy are inextricably linked. When we use one, we use the other because generating electricity usually consumes water. When we burn coal, the long-term trend in our region is to make the place we live hotter and drier. In this way, we are driven to needing ever increasing amounts of energy to cool our homes and deliver us water.

Growth's Ground Zero

Cheap electricity has helped make water abundant in the desert. Today, Arizona, Nevada, and southwestern Utah are experiencing explosive growth. More than a 65 percent increase in electrical demand is projected for the Southwest by 2025, requiring the addition of 12,000 megawatts in new generation.

Arizona Public Service (APS), the nation's fastest-growing utility, estimates that it will need to add 300 megawatts of electricity annually just to keep up with demand. It anticipates investing $15 billion on new generation and infrastructure during the next 10 years.

APS is the leading advocate for building the "TransWest Express" transmission line between Wyoming and Arizona. The utility appears committed to investing as much as $5 billion to construct nearly 1,000 miles of new transmission lines to carry 3,000 megawatts of electricity generated by new power plants located near the coal beds of Wyoming's Powder River Basin.

The Grand Canyon Trust and a coalition of 17 national and regional groups are asking TransWest

Express proponents to evaluate alternative investments in efficiency and wind and solar sources that are located closer to southwestern growth centers. We also question whether rate payers should shoulder the risk of an enormous investment in developing new infrastructures that will exacerbate our need to reduce carbon dioxide and other harmful emissions.

Fueling the Transition

"Nobody in their right mind should be building a coal plant," argues Vinod Khosla, one of the world's leading venture capitalists. He's investing in concentrated solar projects with partners committed to capitalizing on the Southwest's most abundant resource. Khosla is among a growing cadre of innovators who are working to change how we generate tomorrow's energy.

California is leading the nation in reducing energy consumption per person through efficiency measures it began adopting in the 1970s. Although California's population has increased during past decades, its total consumption of electricity has remained nearly constant. The state's economy has prospered, in part, because efficiency saves money.

Last year, California enacted legislation to limit greenhouse gas emissions. It set another critical precedent by adopting a new performance standard that only allows utilities to purchase electricity that is generated at least as cleanly as the most efficient natural gas power plants. That precludes building any more conventional coal plants to supply California's energy demand, and partly explains why proposals for plants in Idaho and Utah have stalled.

California's aggressive goals toward increasing the amount of renewable energy used in the state are stimulating investments in large wind, solar, and geothermal projects. After several years of pressure by the Grand Canyon Trust and clean energy colleagues, Arizona's Corporation Commission adopted new standards that will accelerate renewable energy production in the state. (See accompanying article in this issue).

Arizona can reduce its greenhouse gas emissions to below the year 2000 levels by 2020 by implementing 49 policy recommendations recently developed by a 35-member task force appointed by Governor Janet Napolitano. The task force included representatives from businesses, utilities, cities, and clean energy advocacy groups.

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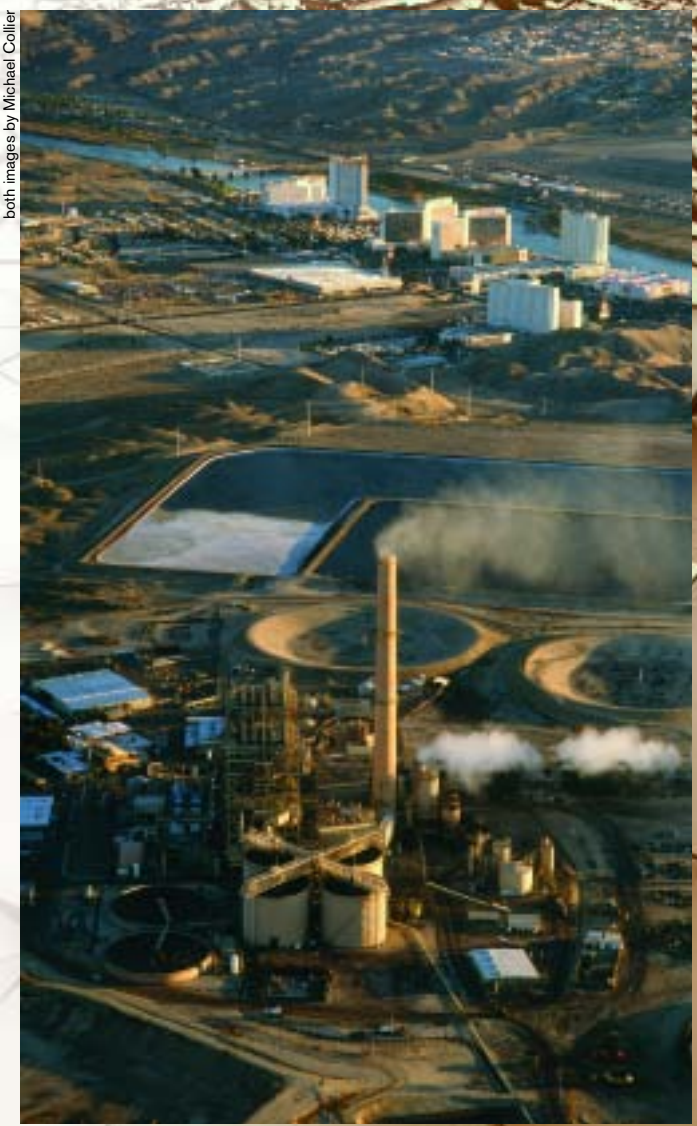
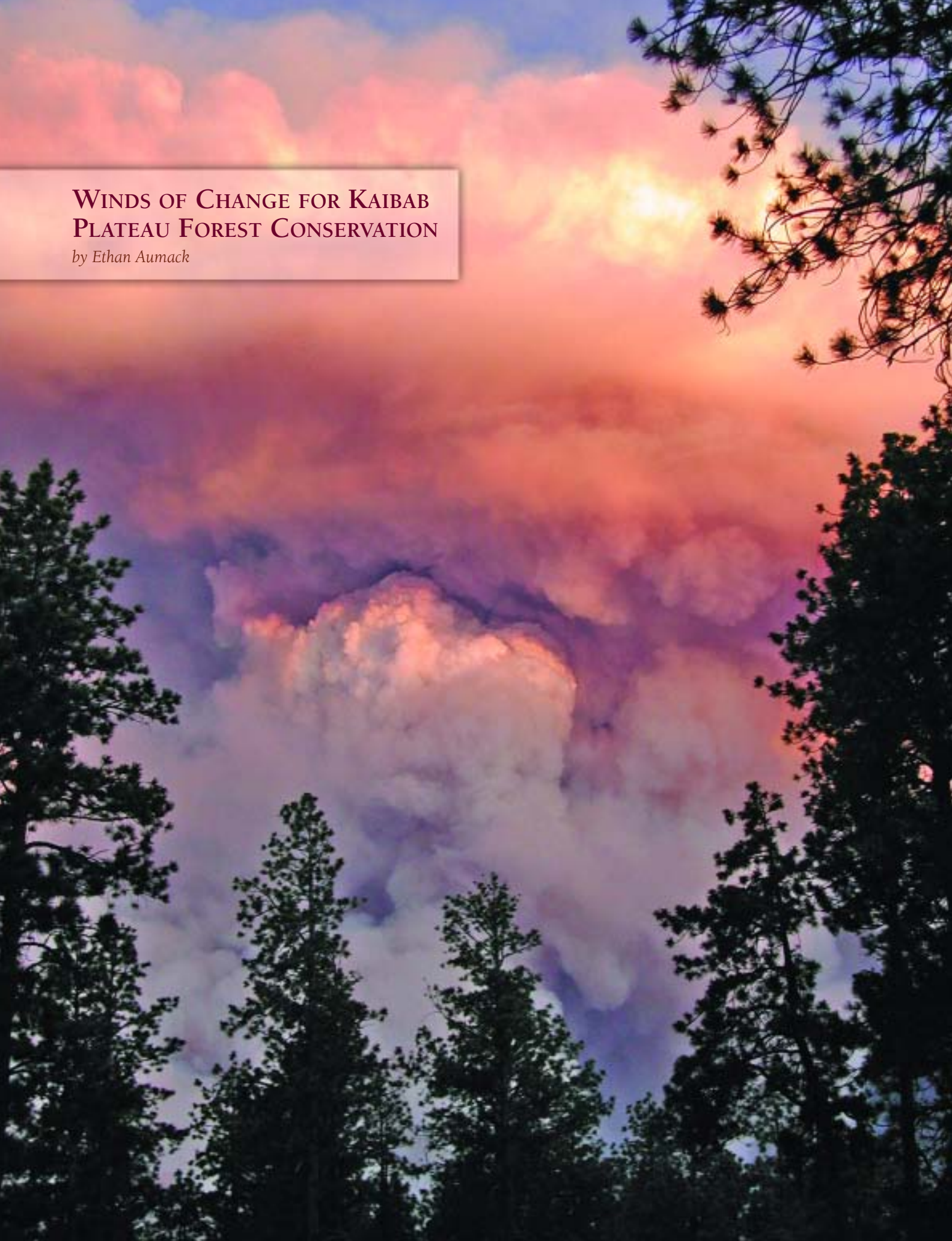
both images by Michael Collier



Mohave Generating Station.
Background: Mudcracks on Little Colorado.



Winds of Change for Kaibab Plateau Forest Conservation

by Ethan Aumack

N AZ Incident Management Team

Heraclitus, a Greek philosopher living in the 5th and 6th centuries B.C., once said, "Nothing endures but change." On June 22, change for the Kaibab Plateau blew in with winds, sweeping strong and steady from the Kaiparowits Plateau towards the San Francisco Peaks to the south.

Strong winds commonly buffet the greater Grand Canyon region throughout the month of June. Southerly summer winds, however, are much less common and, on that June day, took Kaibab National Forest fire management staff by surprise. For 10 days, fire managers had been carefully monitoring a controlled burn, ignited by lightning five miles south of Jacob Lake. Choosing to carefully allow the fire to grow under Wildland Fire Use protocols (see sidebar), managers had tracked it across nearly 1,200 acres. The fire had burned beautifully so far, removing small trees and duff from the overstocked forest, while leaving larger, old-growth trees intact and thriving. In many ways, this fire resembled those that had naturally occurred across ponderosa pine forests in the Southwest for thousands of years prior to Euro-American settlement.

On June 22, however, winds shifted direction and picked up intensity. Within hours, the fire had jumped to the forest canopy, creating walls of flame hundreds of feet high and a smoke plume that rose thousands of feet above the Kaibab Plateau. The Warm Fire began a steady march south towards the Grand Canyon, consuming as much as 24,000 acres a day, and necessitating an evacuation of the North Rim of Grand Canyon National Park. By the time calmer weather returned and the fire was extinguished, it had burned through almost 60,000 acres of pinyon-juniper, ponderosa pine, and mixed conifer forests, surpassing the Bridger-Knoll Fire of 1996 as the largest fire in recorded history on the Kaibab Plateau.

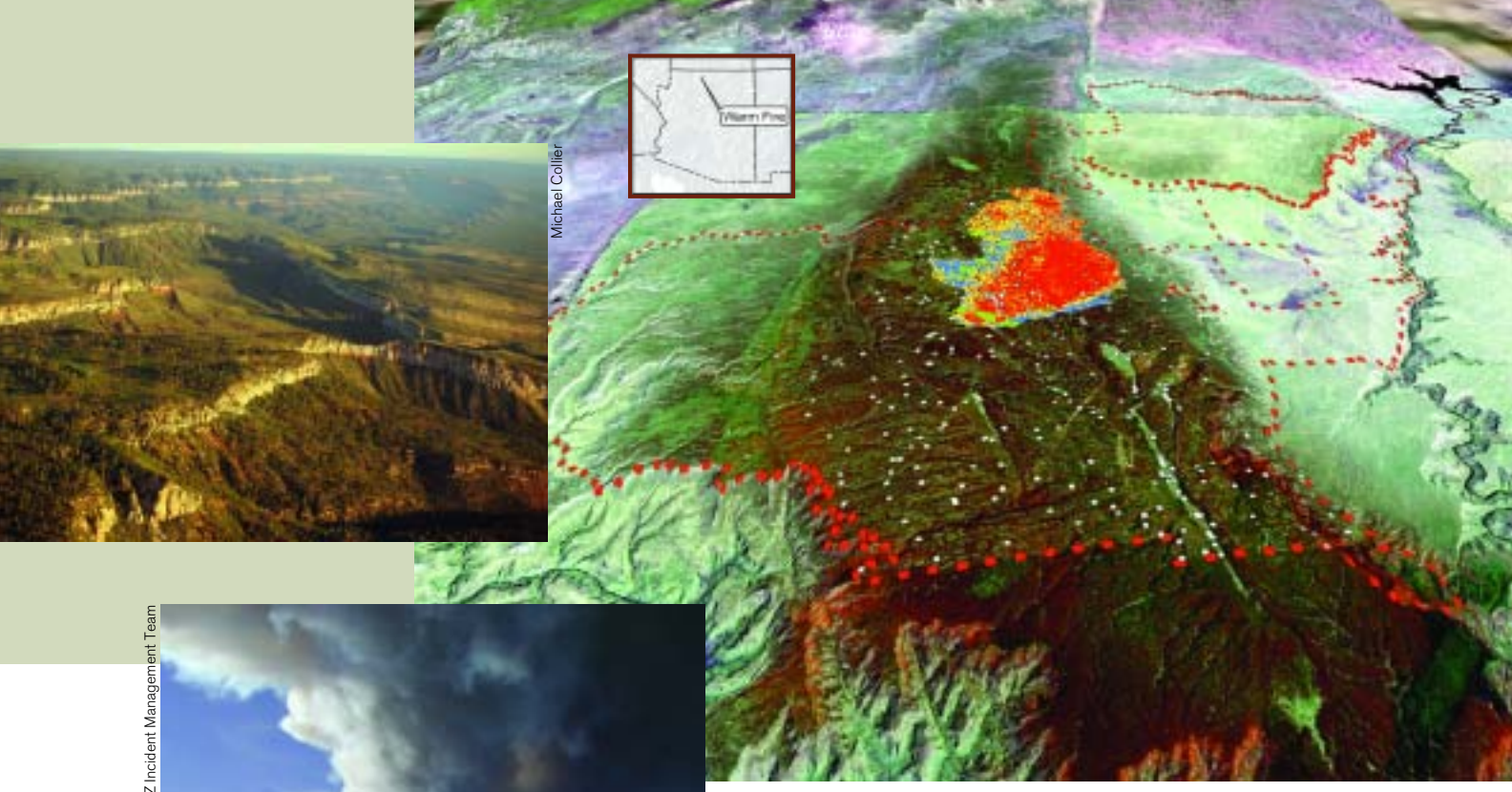
We are hardly limited in understanding the reasons for large "stand-replacing" fires burning as the Warm Fire did. Simply put, these fires are a symptom of declining forest health conditions caused by more than a century of livestock overgrazing, logging, and fire suppression. Our understanding of the risks and short-term effects of such fires is similarly strong. We know that large fires threaten embedded human communities, radically degrade habitat for overstory-dependent wildlife species such as Mexican spotted owl and northern goshawk, promote the spread of invasive non-native species (such as cheatgrass), and lead to significant post-fire erosion and flooding. We know that large fires will continue to burn, and that they may very well burn at an accelerated rate over the coming decades due to climate change and overall global warming.

From the burning Cayahoga River in 1969, to the Cerro Grande Fire of 2000, to the Rodeo-Chediski Fire of 2002, intense fire has generated in our society profound moments of urgency and awareness. Recent large fires in the Southwest have dramatically highlighted the need for comprehensive forest restoration and fire management—not at the scale of thousands or even tens of thousands of acres, but at the scale at which fire is occurring: hundreds of thousands of acres. The Warm Fire has reminded us again of the need for pro-active, landscape-scale forest restoration and fire management across the Kaibab Plateau.

With the Trust's purchase of the Kane and Two Mile ranches, we are well-positioned to advocate for and support the implementation of a visionary, science-based, and citizen-supported forest restoration and fire management program for the Kaibab Plateau. Throughout the summer of 2005, committed Trust volunteers helped assess forest overstory characteristics at more than 150 locations across the Kaibab. We are now working with the Forest Ecosystem Restoration Analysis (ForestERA) project at Northern Arizona University to link data collected with satellite imagery, in the process of developing cutting-edge, Plateau-wide forest structure, fire behavior, wildlife habitat, and watershed maps. We intend to use these maps to develop, for consideration by the Forest Service, long-term, science-based strategies for restoring forest health and reintroducing natural low-intensity fire to the Plateau.

No two forested landscapes are alike. The makeup of forest ecosystems varies widely from place to place, based on such physical factors as elevation, topography, soil, and climate characteristics. When we consider political, economic, and historical factors also unique to individual landscapes, it is easy to understand that landscape-scale forest restoration on the Kaibab Plateau will likely look different from forest restoration elsewhere across the region. Several key factors will drive Kaibab Plateau forest restoration:

Warm Fire explodes on June 25, 2006.



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Photos L to R: The eastern flank of the Kaibab Plateau; Smoke plume generated by the Warm Fire; Cleanup operations; the beginnings of post-fire regeneration. Map: The map above shows the Kane and Two Mile ranch boundaries (dashed red lines), GCT baseline ecological assessment plots (small white squares), and predicted tree mortality within the Warm Fire burn area (area with intermixed shades of red, orange, green, and blue). Areas with high levels of predicted mortality are shown in red, mixed high in orange, mixed low in green, and low in blue.

Predicted mortality data provided by U.S. Forest Service, map generated by Grand Canyon Trust.

• Using fire as a restoration tool

Rising as a sky island on the north side of the Grand Canyon, the Kaibab Plateau is higher and wetter than many forests to the south along the Mogollon Rim. Higher-elevation forests across the Plateau have historically burned hotter than lower, drier forests, and tend to respond more favorably to "mixed severity" fires. Especially given the remoteness of the Kaibab Plateau and the high cost of thinning, prescribed burning and Wildland Fire Use will be essential and potentially efficient restoration tools. Trust staff will work with Forest Service staff to identify fire management strategies that, in combination with strategically placed thinning treatments, will result in smaller and less intense fires that will ultimately reduce the prevalence of large, stand-replacing fires across the Kaibab.

• Managing invasive species

At lower-elevation zones on the east and west sides of the Kaibab, cheatgrass dominates many burned areas. Once established, cheatgrass crowds out native species, destroys wildlife habitat, and is almost impossible to eradicate. We will work with the Forest Service to identify those areas at high risk of cheatgrass invasion, and implement restoration treatments minimizing that risk.

• Mitigating the effects of livestock in fire-adapted forests

Scientists commonly agree that livestock overgrazing contributed to the exclusion of natural fire from ponderosa pine forests across the southern Colorado Plateau. As natural fire is restored to the Kaibab Plateau, it will be essential that livestock be managed to allow natural fire to play an important restorative role. The Trust will work with forest restoration experts to manage livestock across the Kaibab Plateau accordingly.

• Rehabilitating intensely burned areas with an eye towards long-term restoration

Even under the most ambitious restoration and fire management scenario, fires of significant size and intensity will continue to burn across the Kaibab Plateau for decades to come. Post-fire rehabilitation

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Grand Canyon Trust

activities are of paramount importance in determining whether these burned areas follow a path towards restoration or long-term degradation. Hugely contentious and ecologically dubious activities such as broad-scale salvage logging are currently being considered for the Warm Fire area. For the Warm Fire and future fires that burn across the Kaibab Plateau, we will work in concert with the Forest Service to ensure that strong science and restoration values guide rehabilitation work.

Change is, indeed, inevitable. It is difficult to predict precisely how climate change will affect the Kaibab Plateau, or where the next big fire will be. It is, however, possible to strengthen the conservation and restoration foundation of forest management policies and practices here. In the short-term, our work will center on healing the wounds and capitalizing on the ecological benefits of the Warm Fire. In the longer term, however, we intend to work diligently to define a restorative path for the entire Kaibab Plateau. Whether participating as a volunteer on inventory and monitoring trips, helping to reseed burned areas, or becoming a knowledgeable conservation advocate, your participation as a steward for the Kaibab Plateau is vitally important.

Please visit our AZ Forests webpage, *www.grandcanyontrust.org/programs/forests* for more information on the Kaibab Plateau, or see our volunteer website, *www.gcvolunteers.org* for more information on volunteer opportunities.

Wildland Fire Use: Panacea or Pandemonium?

Natural, low-intensity fire has long been excluded from ponderosa pine forests across the southern Colorado Plateau. Heavy "fuel loads" resulting from fire exclusion now exist across most ponderosa pine forests in the region. While we seek to restore natural fire to these forests, fuel loading causes the process to be inherently risky. Small tree thinning followed by prescribed burning has been shown to be a very effective restoration approach. Small tree thinning, however, can be very expensive—costing up to $1000 an acre. As a society, it is unlikely that we will choose to afford to thin more than 20-30 percent of our ponderosa pine forests. Recognizing this fact, the Forest Service has been attempting to restore fire to forests not yet thinned with lower intensity, prescribed burning during cooler months throughout the spring, fall, and even winter. Additionally, fire managers have allowed some naturally ignited wildland fires to continue to burn when conditions permit. These "Wildland Fire Use" (WFU) fires can be one of the cheapest and most effective techniques for reintroducing fire to fire-adapted forests—yet WFU fires are inherently risky, especially during windy, warm summer months. It is tempting to starkly contrast the values and risks of different restoration approaches. The most effective and viable long-term strategy for restoring ponderosa pine forests, however, will likely entail a careful combination and sequencing of thinning, prescribed burning, and WFU fires designed to minimize the prevalence of very large fires, provide protection for critically important habitats (for humans and wildlife), and re-start our ponderosa pine forests on a restoration trajectory.

Ditching Coal—Challenges for the Future of Renewable Energy Sources

by Rose Houk

Comstock Photos

We come to work, switch on the lights, grab a cup of coffee, turn on the computer, and dial in the heat. Daily, most of us go through these motions with barely a passing thought.

But the looming specter of global warming—branded as the most important scientific and technical issue of our time—is creating greater urgency about our energy sources. If burning fossil fuels is the biggest culprit in the gathering of greenhouse gasses, how can we downsize our carbon footprint? More specifically for residents of the Colorado Plateau, how we can wean ourselves off coal.

Coal is the major fuel for the region's large electrical generating plants, and most of it comes from the western United States. The recovery of coal involves mega surface mines, monumental transportation costs, and significant emission control measures at power plants. One major byproduct of burning coal—carbon dioxide—goes into the atmosphere. And, CO_2 is the major constituent of greenhouse gasses.

Cutting CO_2 emissions means ditching coal and other fossil fuels to a certain extent. But what will replace it? What's the "magic bullet" that will support our lifestyle? The answer, in many people's minds, is renewable energy—that is solar, wind, biomass, geothermal, forms of hydroelectric, and, by some definitions, nuclear power as well.

Free Lunch?

Renewable energy sources are clean, green, and free, right? Well, sort of. As we know, "there's no free lunch." Every source of energy bears a cost. In his 2005 *National Geographic* article, writer Michael Parfit put it this way: "The answers are out there. But they all require one more thing of us humans who huddle around the fossil fuel fire: We're going to have to make a big leap toward a different kind of world."

What will that future look like? On the Colorado Plateau, known for abundant sunshine and windy open spaces, two forms of renewable energy—solar and wind—are bound to be big parts of the mix. Both forms confer benefits, but they also present economic, technological, regulatory, and environmental challenges.

Major boosts have occurred at the state level with requirements for higher percentages of electrical power generation to come from renewables. For example, this past November the Arizona Corporation Commission revised its Environmental Portfolio Standard to require 15 percent of all power generated by regulated utilities to come from renewables by the year 2025. Neighboring states have set more ambitious goals to be reached even sooner.

Renewables do present a challenge to utilities. As new technologies, they entail higher capital costs (although large-scale wind has become competitive with new natural gas). And solar and wind, by their nature, are intermittent sources, thus a utility cannot depend solely on them for a steady stream of power. To improve the cost/benefit ratio for renewables, the Arizona Corporation Commission has authorized utilities to raise the surcharge on customers' electric bills.

Catching Rays

The standards further state that a greater percentage of power will be gleaned from what's known in the business as "distributed renewable energy resources"—that is, smaller residential and commercial systems that potentially can put power back into the grid. If you have solar panels on your roof that are generating more electricity than you can use, that electricity goes back into the grid and your meter literally runs backward. For the utilities, which build and maintain the transmission network, that raises scheduling issues.

Another sticking point involves solar access, or "rights" to the sun. If your neighbor puts a solar panel on his roof that blocks your sunlight, or if a homeowner association objects to the panels, Arizona state law, at least, assures solar access. Court rulings largely have upheld the law, but in some places people are still fighting this battle.

Technological issues surrounding solar concern the cost of photovoltaic cells. It is expensive to process the silicon used in manufacturing the cells, and at times the raw material has been in short supply. Also, increased demand drives up the price of panels. Breakthroughs such as "thin-film" cells and concentrated solar systems may lower the cost in the future.

In addition, commercial-sized solar arrays take up large swaths of land. Tucson Electric Power's solar facility near Springerville, Arizona, which provides enough electricity to power the equivalent of 700 homes, occupies more than 16 acres.

The good news for solar electric, however, is that financial incentives are offered through government programs, including rebates and various tax credits and exemptions to help defray the sizable upfront purchase costs. Still, for many prospective customers even these incentives aren't enough to inspire the significant investment.

Blowing in the Wind

Wind energy bestows many benefits: the source of fuel is free, it has no emissions or water needs, and it's available on cloudy days. A single, one-megawatt-capacity wind turbine displaces 2,000 tons of carbon dioxide a year. Large-scale wind facilities leave much of the land in rural and tribal areas available for traditional uses such as grazing and farming.

Small individual wind generators have proved quite feasible for remote homes, cabins, and even boats. One generator on a tower can supply enough electricity for most of a typical household's demands. A Flagstaff business, Southwest Windpower, has emerged as the world's largest supplier of small wind turbines, with nearly 90,000 generators in place. Until recently, the weakest link for these devices was the need for storage in many batteries. The company's "next-generation" turbine just out on the market does not need batteries; a home that's tied into the grid pays for electricity from the utility, but as the breeze picks up the wind generator kicks in. If it produces more power than a household needs, then the meter spins backward for a "credit" to your bill. As with individual solar panels, however, local building and zoning codes usually must be met before a wind generator can be installed.

Utility-scale wind farms are another matter—siting, permitting, marketing, and environmental impacts must all be addressed, and can stretch into a long process. One such project, Foresight Wind Energy's Sunshine Wind Park, is planned for a site east of Flagstaff. The project will include 30 or 40 wind generators on towers up to 400 feet high. Its 60-megawatt capacity could generate enough electricity to supply the equivalent of 14,000 homes, according to Foresight. Baseline biological studies have ameliorated concerns about birds colliding with the rotating blades. The array of machines will be visible on both sides of Interstate 40, a major corridor across the north part of the state, raising aesthetic considerations. The wind park, now fully permitted, waits now for successful negotiation of a contract to sell the power to a utility.

Clearly, the move to reduce reliance on fossil fuels and incorporate more renewable energy will require initiatives at many levels—individual, business, and governmental.

For each of us, every time we turn on the lights we'll need to consciously consider how we can be part of the solution.

Supreme Court Tackles Greenhouse Gasses

by Kristen Carden

One scene from Al Gore's documentary, *An Inconvenient Truth*, stayed with me long after I left the theater. That scene involved a computer-generated polar bear, fatigued from swimming, unable to find any ice upon which to land. It would have been less disturbing if the scenario was no more than a grim prediction, a dire warning of what might be if we fail to address the global warming threat. But the reality is that polar bears are already drowning in the Arctic as the sea ice slowly disappears.

Polar bears are by no means the only species struggling as a result of global warming. In a study recently released by the *Annual Review of Ecology, Evolution and Systematics*, biologist Camille Parmesan reports on dozens of species in trouble because of climate change, including 70 (primarily mountain-dwelling) frog species that have already gone extinct as temperatures exceed tolerable thresholds.[1] Climate change also presents a direct threat to the wildlife, floral communities, and cultural resources of the Colorado Plateau. Desert bighorn sheep within Grand Canyon, Zion, and Canyonlands national parks face possible extinction. Increasing flooding, erosion, and wildfires threaten cultural resources within Canyon de Chelly National Monument. Rising temperatures favor a continuing influx of invasive plant species, such as tamarisk and Russian olive, and long-term warming may convert the shrub steppes of Arches, Bryce Canyon, and Capitol Reef to savanna woodlands and grasslands.[2] Indeed, the threat to park resources is so great that some commentators identify global warming as "the single greatest threat ever to face western national parks."[3]

While the impacts of global warming are clearly visible within our national parks, and while the scientific community agrees that humans are contributing to climate change, the United States has yet to develop a comprehensive strategy to address the problem. The U.S. Supreme Court may soon provide some direction in this regard when it decides the case of *Massachusetts v. Environmental Protection Agency*. At issue is whether the Clean Air Act authorizes the Environmental Protection Agency (EPA) to regulate greenhouse gasses emitted from new motor vehicles.

EPA's Stance

The EPA argues that it does not have authority under the Clean Air Act to address global climate change, and that greenhouse gasses such as carbon dioxide do not fall under the Clean Air Act's definition of an "air pollutant." The EPA further argues that even if the law *does* authorize greenhouse gas regulation, such regulation is discretionary and the agency will not act on its authority at this time.

The EPA relies on several "policy considerations" to rationalize its refusal to regulate greenhouse gasses. First it argues that the science of climate change is dogged by uncertainty, and we must wait until scientists collect more data before addressing the global warming threat. Second, the agency argues that because emissions from new motor vehicles in the United States account for only a small fraction of worldwide greenhouse gas emissions, they should be regulated only as part of a more holistic global warming initiative. The EPA also suggests that regulating new motor vehicle emissions in the United States would somehow be a disincentive to developing nations in reducing their own greenhouse gas emissions. Finally, the EPA alleges that we should allow more time for innovation since the technologies needed to reduce greenhouse gas emissions might not yet be available.

Massachusetts' Stance

Massachusetts disagrees with the EPA's position that the Clean Air Act does not authorize regulation of greenhouse gases. On the contrary, Massachusetts argues, the act demands such regulation. Since greenhouse gasses are "physical or chemical substances" that are "emitted into the air" by new motor vehicles, they fall clearly within the Clean Air Act's definition of an "air pollutant."

Massachusetts further argues that the EPA must regulate greenhouse gas emissions because the Clean Air Act requires regulation of air pollutants that "may reasonably be expected to endanger public health or welfare." The Clean Air Act's definition of "welfare" specifically includes effects on weather and climate. As the petitioners note in their brief, "It would be strange indeed for Congress to conclude, so pointedly, that climate and weather are important components

of human welfare, yet to deprive EPA of authority to do anything about the pollutants that most affect these features of our environment."

Discussion

Massachusetts seems to have the stronger substantive argument in this case. The EPA's logic is strained, and the agency relies on policy arguments outside the scope of the Clean Air Act to bolster its position. For example, the EPA resurrects the age-old anti-global warming argument of uncertain science. While questions concerning the intricacies of climate change undoubtedly remain, scientists agree that human activities are impacting the earth's climate.[4] In fact, the very report EPA relied on to support its scientific uncertainty argument begins by stating unequivocally that "[g]reenhouse gases are accumulating in Earth's atmosphere *as a result of human activities*, causing … temperatures… to rise."[5]

A more fundamental problem with the EPA's uncertainty argument is that it plays on common misperceptions of science. Science, by its very nature, is incapable of providing the conclusive "proof" the EPA desires. There will *always* be more questions to ask, more data to collect, more opportunities to refine or even overturn well-supported hypotheses and theories. By continuing to wait for more and better data, we will only succumb to "paralysis by analysis."[6]

There is no need to wait. We can, and we must, act now.

The Supreme Court's opinion in *Massachusetts v. EPA* will issue sometime this year. Even if the Court rejects Massachusetts' argument (or denies Massachusetts' standing), the issue is far from resolved. It is likely that the Court's decision will trigger a rash of global warming lawsuits. In addition, Congress can always intervene and enact climate change legislation—a prospect that seems politically plausible after last November's elections. Regardless of how the *Massachusetts* decision comes down, we as the public need to let our lawmakers know how important global warming issues are to us, to our country, to the world … and not least of all, to the polar bears swimming toward the horizon.

Michael Collier

Mohave Generating Station.

Notes

1 Camille Parmesan, "Ecological and Evolutionary Responses to Recent Climate Change", 37 Ann. Rev. of Ecol., Evolution & Systematics 637 (2006).

2 P. Gonzales et al., "Global Warming Vegetation Shifts Across Global Ecoregions", 90 Ecol. Soc. of Am. Ann. Meeting Abstracts 228 (2005).

3 Stephen Sanders & Tom Easley, *Losing Ground: Western National Parks Endangered by Climate Disruption* 2 (July 2006), *available at* http://www.nrdc.org/land/parks/gw/gw.pdf.

4 Naomi Oreskes, "The Scientific Consensus on Climate Change", 306 Science 1686 (2004).

5 National Research Council, *Climate Change Science: An Analysis of Some Key Questions* (2001).

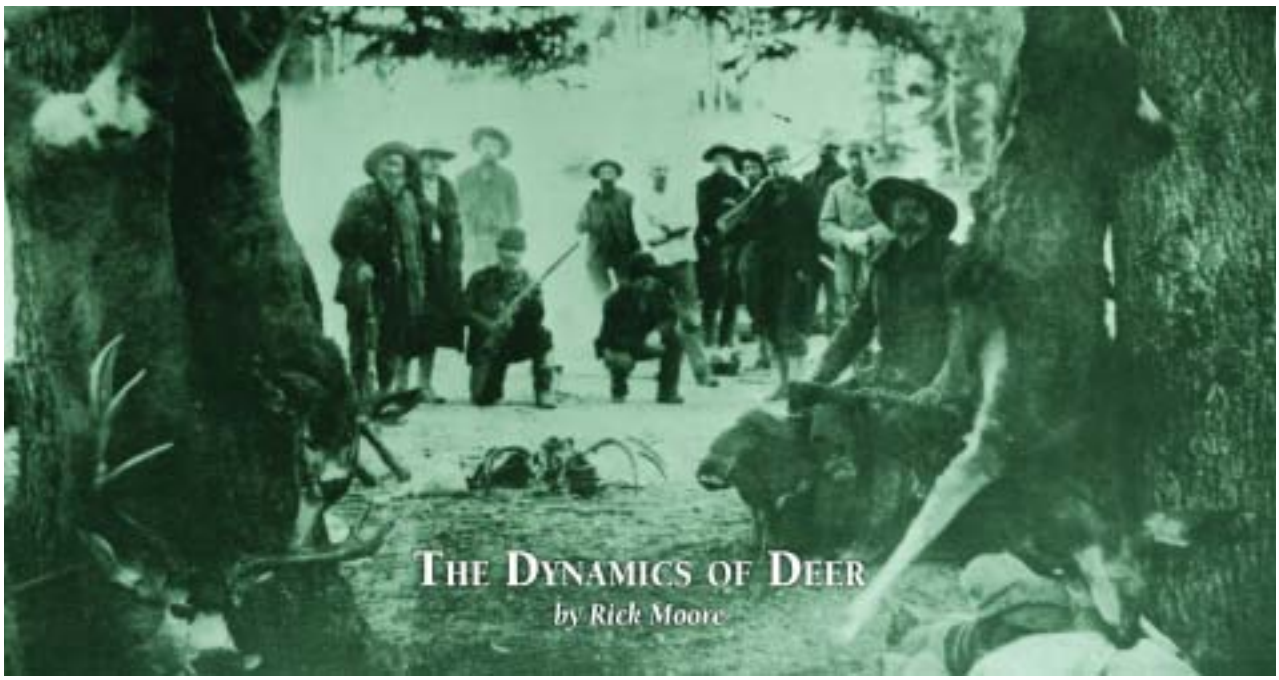
6 David C. Vladeck & Thomas O. McGarity, "Paralysis by Analysis: How Conservatives Plan to Kill Popular Regulation", Am. Prospect, Summer 1995, at 78.

The Dynamics of Deer

by Rick Moore

The Kaibab Plateau on the North Rim of the Grand Canyon is home to one of the finest deer herds in the United States, and in 1892 Buffalo Bill Cody brought a few English aristocrats to the area as part of a scheme to build a hunting lodge for the wealthy. The Englishmen appreciated the hunting, but decided the area was too remote and the idea was dropped.

However, in 1906, the importance of the abundant wildlife on the Kaibab Plateau caused President Theodore Roosevelt to establish the Grand Canyon Game Preserve. According to the proclamation, it was *set aside for the protection of game animals and shall be recognized as a breeding place therefore, and that the hunting, trapping, killing, or capturing of game animals…is unlawful*. Unfortunately, the Preserve regulations allowed hunting many non-game animals, including mountain lions, wolves, coyotes, wild cats, skunks, and rabbits.



Utah State Historical Society

Buffalo Bill and English hunting party. Kaibab Plateau 1892.

During the next several years, according to one count, 781 mountain lions, 554 bobcats, 20 wolves, and about 5,000 coyotes were killed on the Kaibab Plateau. When the Preserve was created, there were an estimated 4,000 mule deer living on the Kaibab. By the 1920s, with fewer predators and no hunting, that number soared to 50,000 to 100,000, causing both the deer and the plants they ate to suffer.

In 1924 the Forest Service had become increasingly concerned about the damage being caused by the deer and so opened the Kaibab Plateau to hunting, without speaking to Arizona wildlife officials first. In Arizona, as in most western states, wildlife is owned by the state, not the federal government. When three hunters killed deer in the Preserve with the blessing of the Forest Service, Arizona sued. The U.S. Supreme Court ruled in the Forest Service's favor, although the court ruling suggested that this was an exceptional circumstance, and still favored a state's right to regulate hunting.

About the same time, Flagstaff resident George McCormick proposed to reduce the size of the deer herd by driving 5,000 to 8,000 deer from the North Rim across the Grand Canyon to the South Rim. Arizona Governor George Hunt agreed to pay McCormick $2.50 per deer that he got across the Canyon.

McCormick hired nearly 200 Navajos and 50 mounted cowboys to gather and herd the deer. Author Zane Grey showed up with a movie crew to film what was touted as the "Great Kaibab Deer Drive." But the deer refused to be driven like cattle and the failed drive lasted less than a day. R. H. Rutledge, the district forester, said it was the most interesting failure he had ever witnessed.

Aldo Leopold, who had heard about the Kaibab deer population explosion and collapse, used the story as a classic example of what can happen when predator-prey relationships are disrupted. For many years, the Kaibab deer story was used in ecology textbooks, but then in the 1970s a well-known ecologist named Graeme Caughley challenged it because the data upon which the story was based was incomplete and inconsistent. Textbooks dropped the story, and only recently have a few ecologists begun to reexamine the early data and to bring new techniques to bear on the story.

For example, a recent study on aspen regeneration on the Kaibab Plateau (young aspen are quite delectable to deer) concluded that while the deer population did most likely increase and decrease dramatically, and predator-prey relationships may have played a significant role, other factors, such as suppressed fire, also should be recognized as contributing forces.

Chris Young, author of *In the Absence of Predators: Conservation and Controversy on the Kaibab Plateau,* concluded that whatever the real dynamics of the deer population might have been, the Kaibab deer story is an excellent example of the interaction of science, conservation, politics, and management.

"I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too many deer may fail of replacement in as many decades."

– Aldo Leopold

Arizona State Lands Initiative Loses in Close Election

by Nikolai Ramsey

In a previous *Advocate* article I wrote of times shared with a companion Boston Terrier on top of Observatory Mesa, a piece of land in Flagstaff proposed for conservation protection in a statewide initiative. Unfortunately, the initiative failed and the mesa remains unprotected.

In a squeaker, Proposition 106, Arizona's state lands conservation initiative, lost by 51.3 to 48.7 percent—38,000 votes—in the November election. The defeat came at the hands of rural county voters as every rural county except Santa Cruz voted against the measure. Pima County, long considered to be a bastion of conservation voters, passed the initiative but the close 2,549 vote margin was much less than expected. The measure won in Maricopa County by 5,246 votes. In Coconino County, where the Grand Canyon Trust in coordination with Friends of Flagstaff's Future conducted a direct mail, print ad, early voter, and get-out-the-vote campaign, Proposition 106 won by a nine percent margin.

If the initiative had passed, it would have protected more than 62,000 acres in northern Arizona. Not just Observatory Mesa, but lands near Grand Canyon, Walnut Canyon National Monument, Wupatki National Monument, Rogers Lake, and Dry Lake, all would have acquired conservation protection.

During the campaign, our primary opponents, the Homebuilders Association of Central Arizona, the Arizona Cattle Growers' Association, and the Arizona School Boards Association, spent over $2 million on their falsehood-laden "NO on 106" campaign. Still, the election was close. Pat Graham, state director of The Nature Conservancy, spoke positively about what happened: "While our campaign is disappointed with the results, this election is only the first step on the road to protecting some of Arizona's treasured land and water from development. The people of Arizona are clear about the value they hold for conservation, and as our communities grow, they are galvanized more than ever to protect those natural areas that make our state a special place to live."

Sadly, this won't be the year that Arizona sees its most precious places conserved. State lands like those atop Observatory Mesa must await future efforts for their protection. Supporters of state trust land reform are already discussing possible conservation strategies. As development grows exponentially, the idea of conserving some of Arizona's land for the benefit of all Arizonans becomes ever more compelling.

Tom Bean

Ranch manager John Heyneman cradles the first calf born to the Trust's Kane-Two Mile herd.

—by John Heyneman

Kane Ranch

Last winter was one of the driest on record on the Kaibab Plateau, and we worried all spring about summer stock water availability. By mid-May of 2006 we had purchased half of the 720 head of cattle required to validate the Forest Service grazing permit. We intended to begin the summer grazing season with 400 animals and then purchase the remainder when we knew we had sufficient stock water. We determined which summer pasture to use, worked to repair fences, and established a regime to monitor water availability. Then, in June, the Warm Fire burned nearly 60,000 acres on the Kaibab Plateau including the pasture we planned to graze.

The Warm Fire set us back and forced us to alter our grazing plans. However, the monsoon brought a dramatic weather change and delivered more than four inches of rain to the Kaibab at the end of July and another two inches in August helping extinguish the Warm Fire and fill stock ponds. Though late in the season, the rains allowed us to move ahead and purchase the remaining cattle to validate the grazing permit. On September 21 we were notified that we successfully fulfilled all requirements and the permit was officially validated.

We began gathering and shipping cattle in October and soon thereafter were forced into another dramatic change of plans. Unknown to us, the Forest Service had permitted an endurance horse race on the North Kaibab—in the exact area where we had placed the first 400 cattle. There were hundreds of people and horses training and racing on that day and their activities scattered our cattle to the wind. We're still struggling to relocate some of them. The Kaibab is notoriously rough country, and permittees traditionally labor to find all their cattle. Nonetheless, we expected the "gather" to be complete in around three weeks but, to date, we have been riding every day for well over a month and are only about half done. It will likely get more, not less, difficult, but we are making steady, albeit slow, progress. Once we have the cattle gathered from the Kaibab and delivered to the winter country in House Rock Valley, we will sort through the cattle, market the calves and determine which cows to keep for the next year. Come early May, those animals will then be moved to the western slope of the Kaibab for the duration of the spring and then back to the top of the plateau in July.

Two Mile Ranch

We have entered into an agreement with a partnership of two Kanab-based ranchers to run cattle on the Paria Plateau. We have begun assessing the infrastructure and expect to place cattle on the allotment sometime this winter. We have a good working relationship with one of the ranchers and are confident that we can work cooperatively with him and his new partner. Under the arrangement we are ultimately responsible for ensuring the well being of the allotment. The ranchers will provide the cattle and day-to-day management, and will be responsible for upkeep and maintenance of improvements. North Rim Ranch will provide necessary capital improvements and maintain relationships with the appropriate governmental agencies. We will jointly formulate a grazing plan as well as an infrastructure improvement and cultural resource protection plan to serve the long-term interest of the Paria Plateau.

Utah's Toxic Waterways

by Laura Kamala

I've lived for 30 years with the legacy of the Atlas uranium mill tailings pile perched on the bank of the Colorado River in Moab, Utah, knowing its toxins were streaming downriver to millions of other people. The effects of our human imprint on the global environment are omnipresent; atmospheric jet streams deliver us a profusion of pollutants from distant industry. Still, it was difficult for me to receive the news that Mill Creek, a seemingly pristine trout stream tumbling out of the nearby La Sal Mountains, is full of methylmercury.

In 2005 the State of Utah issued its first ever fish consumption advisory due to the presence of toxic mercury exceeding EPA limits. Brown trout in Mill Creek overshot the federal standard by an average of 27 percent. In Desolation Canyon on the Green River, channel catfish had a similar diagnosis; largemouth bass from Gunlock Reservoir were also deemed fit only for limited human consumption. Further, in September 2006, Utah issued the nation's first toxic duck advisory; the Great Salt Lake's northern shoveler and common goldeneye were too poisonous to eat. U.S. Geological Survey researchers found Great Salt Lake mercury concentrations among the highest ever recorded in surface waters.

Where's it all coming from? Utah's Department of Environmental Quality Mercury Work Group is charged with finding answers. The largest source of environmental mercury is coal-fired power plants, followed by industrial boilers, municipal waste combustion, and medical waste incineration. Some mercury in the Great Salt Lake likely comes from gold mining in Nevada. A great deal of mercury found in seemingly pristine places comes from atmospheric deposition.

When airborne mercury particulates precipitate from the atmosphere into waterways they are converted by bacteria into the highly toxic organic compound methylmercury. This most toxic form of mercury, a persistent pollutant that doesn't break down, then accumulates and magnifies up the food chain. Bioaccumulation occurs when an insect, fish, or mammal ingests mercury at a rate which exceeds the metabolic capability of that organism to excrete it. Methylmercury is thought to have a greater power of biomagnification than almost any other substance known. A large, predatory fish may have one million times more concentrated methylmercury in its body than is present in the water in which it lives.

Even trace amounts of methylmercury, which produces neurological and developmental damage, put infants and the unborn at serious risk. Studies in Texas suggest a direct link between concentrations of mercury in the environment and child autism rates. November 17, 2006 was the deadline for states to submit their plans to reduce toxic mercury emissions to the Environmental Protection Agency. Air regulators in 22 states want to adopt tougher standards than those now in place—Utah was not among them.

Tom Till

Grand Canyon Trust is pushing for regulation of mercury emissions from proposed new coal-fired power plants in the region. Meanwhile, work has begun to relocate and reclaim the Atlas uranium tailings pile due in part to the 12-year effort of the Trust's executive director, Bill Hedden. And though we're a long way from solving the mercury pollution problem, there is hope. The Japanese company Ebara now promotes technology using specialized bacteria that remove toxic, heavy metals like mercury from polluted water and soils so they can then be recycled.

To track future mercury advisories and progress at the Utah Mercury Work Group visit www.deq.utah.gov

An Abundance of Richness

by Mary O'Brien

As a distinct continental mass for 500 million years and as an intact tableland for most of the past 60 million years, the Colorado Plateau has been available for settlement by plants and animals for a long, long time. Canyons great and small have been cut by the Colorado River and its multiple tributaries, while molten rock also has bulged upward creating isolated mountains. As a result, this high, old plateau holds biological niches from scattered tundra at the mountain summits to narrow, deep canyons. Over time, Great Basin species have wandered into the Plateau from the west and south, and Rocky Mountain species have entered from the east and north.

The result? An unusually large collection of species has been able to settle in the Plateau's complex terrain. Some of the species are immigrants; some evolved here. Some are widespread, while others are naturally rare. For those called endemics, the Colorado Plateau is their *only* home on earth.

Vascular plants, the so-called "higher" plants, abound in the Plateau's mountains and canyons. Also, the mountains harbor an abundance of snails and tree species, and the canyons host comparatively high numbers of reptiles, mammals, and butterflies. More than 550 bee species, many of them endemic, are already known to inhabit the Plateau, and yet parts of the region have barely been sampled. As pollinators, these bees can be assumed to be crucial to the reproduction of many native plants, but often we don't know which plants those are.

As the accompanying chart indicates, we might have cause to celebrate a momentary scorecard-victory because "Our" Plateau beats out the Colorado Rockies, Sonoran Desert, the Pacific Northwest's Cascadia, and that icon of wildness, Yellowstone, for species diversity. But if we linger on the real meanings of the chart, more helpful insights arise:

• Each species diversity number is full of life

Imagine wandering from early spring in the Plateau's canyons through summer up into its mountains in search of butterflies, and encountering more than 200 different kinds. Imagine learning the intricate life history of each butterfly: which species of plant(s) it entrusts with its eggs and larvae, which strategy its larvae use to pass through the leafless cold of winter, which flowers it selects to drink from the following summer, which predators it must evade, whether it makes sounds to attract ant protectors, and where it gathers to find mates.

If we knew each of our Plateau butterfly neighbors, we would be dizzy with geography, botany, soils, microclimates, and plant and animal give-and-take. Then imagine learning the idiosyncrasies and strategies of each of 83 different snails inhabiting the Colorado Plateau mountains. Can you name 100 mammals in the world, let alone the 107 mammals that have adapted to the Colorado Plateau's canyons and to each other?

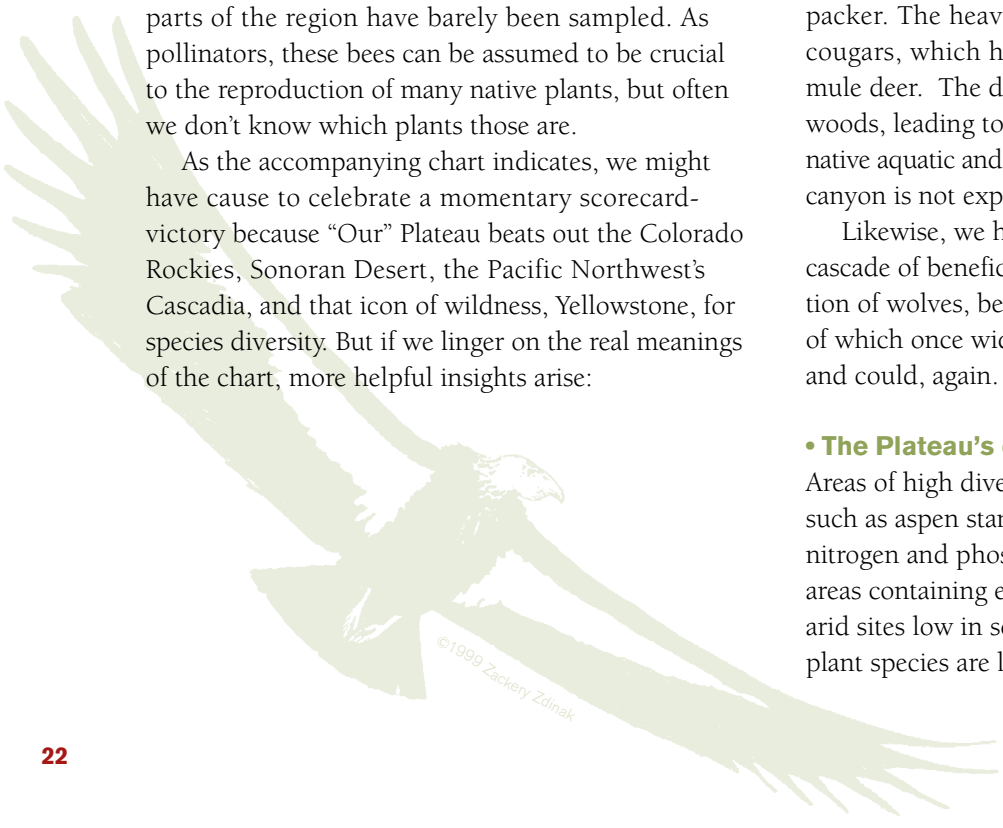
• These species are linked

Recent research in Zion National Park, for instance, compared one Zion canyon heavily visited by tourists, with another frequented only by the occasional backpacker. The heavily visited canyon is avoided by cougars, which has resulted in a large increase of mule deer. The deer are overbrowsing young cottonwoods, leading to loss of stream bank integrity and native aquatic and terrestrial species. The rarely visited canyon is not experiencing these losses.

Likewise, we have been learning of the astonishing cascade of beneficial changes that attend the restoration of wolves, beaver, aspen, and sage grouse—each of which once widely inhabited the Colorado Plateau and could, again.

• The Plateau's diversity is widespread

Areas of high diversity (e.g., high-elevation habitats such as aspen stands and riparian areas high in soil nitrogen and phosphorus) tend to be different from areas containing endemic species (e.g., low-elevation, arid sites low in soil phosphorus); and most native plant species are locally rare. Moreover, native carni-



	Colorado Plateau Canyons	Colorado Plateau Mountains	Greater Yellowstone	Sonoran Desert	Colorado Rocky Mountains	Cascadia
Amphibians	12	11	6	12	7	19
Snails	41	83	12	35	37	10
Mussels	6	3	5	1	Unavailable	11
Crayfish	1	1	3	0	Unavailable	9
Fish	37	12	50	19	Unavailable	69
Reptiles	61	31	10	58	7	14
Mammals	107	79	69	82	81	64
Butterflies	225	201	173	168	224	130
Birds	222	208	201	261	210	202
Vascular Plants	2,556	2,204	1,993	2,068	1,626	1,296
Conifers	4	16	13	1	15	18
Trees	38	67	28	36	35	36
Total Species	3,310	2,916	2,563	2,741	2,242	1,878

Areas with the greatest species richness are shown in orange; second richest areas are highlighted in green.

Ricketts, T. H., E. Dinerstein, D. M. Olson, C. J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P. T. Hurley, K. M. Carney, R. Abell, and S. Walters. 1999. *Terrestrial Ecoregions of North America: A Conservation Assessment.* Island Press, Washington, D.C.

vores such as cougars, bears, goshawks, and wolves must range widely to sustain healthy populations. Thus it's not a matter of simply identifying "hotspots" for protection.

• The biological richness of our Colorado Plateau mountains is greater than we may have realized

The Grand Canyon, with its tassel-eared squirrels, mule deer irruptions, and reintroduced condors, is famous. So, too, are southern Utah's redrock canyons with their hanging gardens, ravens, and thumbnail-sized frogs. On the other hand, the Plateau's mountains, particularly in southern Utah, have been treated largely as caches of uranium, oil, gas, coal, logs, irrigation water, and livestock forage; as feeding grounds for large populations of huntable elk; and most recently, as playgrounds for the exploding human population and its motorized vehicles. The wild, native biodiversity of these mountains, which are largely contained within the Dixie, Fishlake, and Manti-La Sal national forests, has often been, at best, an afterthought.

• Native species can be lost slowly, silently, and without witnesses

Who is on the ground ensuring the health of each of the Plateau's 550 bee species, or the native plant(s) each is tied to for nectar and pollen? Who is tracking whether the reproduction of any of the canyons' 3,000+ species of plants is declining because its native bee pollinator is declining? Who will notice when a terrestrial snail, whose only populations are at the base of a cliff, is eliminated during road building?

Even conservationists can't promise to be there for every species. However, every one of the Trust's programs—whether energy, Native American communities, the Colorado River, Kane and Two Mile ranches, land exchanges and purchases, or southern Utah's Three Forests Coalition work—is focused on protecting and restoring the Colorado Plateau's complex diversity of plants and animals—and our relationships with this astonishingly alive Plateau.

Honoring the Old, Embracing the New

by Tony Skrelunas

Northern Arizona University Cline Library—Special Collections and Archives

Navajo woman dresses husband's hair.
Background: Shonto, Arizona.

Shonto is a hard place to miss. If you have ever traveled Navajo country, especially the roads between Lake Powell, the Hopi Mesas, and Monument Valley, you have driven through Shonto. You probably noticed the State Routes 160 and 98 intersection where the road crosses Peabody Coal's Black Mesa rail line. At noon, the turnoff is usually occupied by a Navajo vendor who barbecues from the back of a flatbed pit just north of the intersection. At first glance, the area seems quiet and surreal, especially on a crisp winter afternoon.

This little community on the western side of the Navajo Nation has taken a dynamic and courageous step. It is the first of 110 Navajo Chapters to gain Local Governance independence from the massively bureaucratic Navajo Nation government. This act means the chapter has authority to zone, make law, tax, finance, and adopt more effective forms of governance. Shonto is home to world renowned artists, bull riders, fantastic landscapes, and strongly traditional Diné people. Here the best of the modern and traditional worlds intersect. In the homes, many of the elders are hardly impacted by the hustle and bustle of the outside world. Grandparents still eat their ancient traditional meals on the floor and tell stories handed down through the centuries. Most homesteads have a hogan. The rich traditions of the Diné are still practiced. Many of the men still wear their hair with the traditional *tsiiyeel* (hair bun) that signifies wisdom and is believed to bring rain to this high desert. The women still wear traditional Navajo attire adorned with silver and turquoise in order to be presentable to Diné deities.

At the same time, through Local Governance, the Chapter or Shonto Governance as they like to be called, has made incredible strides towards modern self-sufficiency. The community has chosen to pursue a diversified, sustainable economy less dependent on coal mining. Two summers ago, we were fortunate to be asked by the Chapter for our vision of how they could achieve self-sufficiency. We went to work. First, we co-hosted a strategic planning retreat that brought focus and follow-through to the community. As with all our work with indigenous peoples, we offered a template that would allow the members to set a vision, identify critical values and goals, and gain commitment from a consortium of resource partners, to serve as criteria for future growth and

development. In just one year, amazing progress has been made. Many of the goals outlined in the plan have been achieved: adoption of a more traditional form of local government entitled "*Council of Nat'aa*," development of a master plan for a sustainable, mixed-use development, a new artist and visitor plaza, a 10-acre retail park, rural electrification, and tourism planning. The Chapter Governance has created a community development corporation and community foundation to carry out its strategic goals.

As a result of this progress, we were more than happy to co-host a second planning session. This session brought additional focus to the goals and a plan into which the Grand Canyon Trust is now interwoven as a partner.

As a partner, the Trust is providing assistance with three projects:

First, Shonto is the first Native American community to express a major desire to create a locally owned renewable energy utility. We are partnering with organizations such as Arizona's Native American Energy Office and Northern Arizona's Sustainable Energy Solutions work group to help draft a local renewable energy business plan, secure grants for various stages of the start-up process, and ultimately help create the enterprise. Legal guidance will be critical to ensure a well-designed, Shonto-owned renewable energy enterprise that contains effective business organization and offers investment opportunities for other communities. We will also work with Shonto to attract other investment from the Navajo Nation and nearby communities. We want to explore the potential of a tribal renewable energy co-op that would be owned by several communities and conduct larger renewable energy projects in other communities and off-reservation fee lands.

Second, Shonto has engaged the Drachman Institute from the University of Arizona to develop a master plan for a sustainable, mixed-used development. This could include areas for apartments, a new local government center, recreation center, and businesses. The master plan emphasizes environmental sensitivity incorporating use of renewable energy, water harvesting, and energy-efficient architectural design. We plan to continue facilitating to ensure completion of this pioneering development in Shonto, and we expect to continue assistance with strategic planning, grant-writing, and business planning.

Third, Shonto has already made major progress with a 10-acre retail development to generate local-owned business opportunities, jobs, and local tax revenue. With newly constructed turnout lanes, infrastructure, and preparation, the business site is ready. We are working on a business plan for the retail portion of the site that would contain a café, shops, visitor center, and other amenities.

Shonto is home to world renowned artists, bull riders, fantastic landscapes, and strongly traditional Diné people. Here the best of the modern and traditional worlds intersect.

Every community needs a champion to lead and inspire. We must recognize the major champion for all this work: Jonathan Nez, the Shonto Chapter's vice president. Jonathan is the ultimate representative for Shonto's and the Navajo Nation's future. While revering the past, he is young, aggressive, eloquent, and extremely bright. He is also currently completing a doctorate degree in political science at Northern Arizona University. Mr. Nez has brought most of the partners to the table. He has gained commitments and ensured follow-through. He was recently elected, in a landslide victory, to serve on the Navajo Nation Council. With his wisdom and energy, Jonathan Nez will do very well in making change at the central Navajo Nation level.

We thus are excited about what the future holds for this model community, one that honors the traditions of the past while blazing a completely new path. We are lucky to be a witness and a partner to this amazing transformation. The environment is a major benefactor. We hope to show that you don't need to mine more coal to be self-sufficient. You can create a diversified and sustainable economy that offers competitive jobs for community members.

Robyn Slayton-Martin, a fourth-generation Flagstaff resident, joined the Trust in July 2006 as Development Manager. Robyn's long history with non-profit organizations includes positions with Lowell Observatory, the Museum of Northern Arizona, Greenpeace U.S.A., and the Center for Creative Photography in Tucson. Her most recent position was with Northern Arizona University, where she taught English part-time while completing her Master's degree.

As Development Manager, Robyn will focus her attention on the Trust's fund-raising duties related to grants management, including writing and editing support for proposals and reports and researching new funding possibilities; growing the Trust's planned giving program; increasing our mid-level donor base, and organizing donor trips. In addition to these responsibilities, Robyn will provide program support for Communications as well as our Volunteer program.

Ms. Slayton-Martin received her M.A. in English (Rhetoric and Professional Writing) from Northern Arizona University in May 2006, and her B.A. in English from Northern Arizona University in May, 2003. Robyn finds personal enjoyment in trail-running; camping, hiking, and running rivers all over the Colorado Plateau; volunteering for community organizations; and writing non-fiction essays about her Plateau adventures.

Kristin Carden became the Staff Attorney for the Trust in October 2006. Prior to joining the Trust, Kristin volunteered at Katmai National Park and Preserve in Alaska where she provided bear safety orientation to the park's visitors. She went on to become a ranger at the park where she was charged with brown bear management and monitoring. Later she assisted with a hawksbill sea turtle recovery project at Hawaii Volcanoes National Park and taught high school science in Manoa, Hawaii.

As Staff Attorney, Kristin serves as in-house liaison between Trust staff and outside counsel on current and pending litigation. She also provides strategic advice to the program staff on legal issues involving their programs. Prior to joining the Trust, she was a legal intern for the Natural Resources Defense Council and served as an associate at Steptoe & Johnson law firm in Phoenix, Arizona.

Ms. Carden earned her J.D. at Harvard Law School where she was also senior editor of the *Harvard Environmental Law Review*. She received a B.S. in Renewable Natural Resources from University of Arizona and was the recipient of the UA School of Renewable Resources Outstanding Senior Award. Kristin enjoys hiking, camping, yoga, drawing, and Hawaiian quilting in her spare time.

UPCOMING EVENTS

On April 15-19, 2007 Wild River Expeditions will host a special San Juan River journey to benefit the critical work of the Volunteer Conservation program at the Grand Canyon Trust. The five day "*Explore Canyon Country to Help Restore Canyon Country*" expedition will take participants on a 58-mile run into the remote lower canyon of the San Juan River where they will experience some of the Colorado Plateau's most wonderful scenery and solitude. The cost is $1100 per person and a portion of the proceeds will be donated to the Trust's Volunteer Program. For more information, please contact Wild River Expeditions in Bluff, Utah at 800-422-7654 or wildriv@frontiernet.net.

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The recommendations would create $5.25 billion in net savings from electricity, primarily through cost-effective investments in energy efficiency. New Mexico and more recently Utah also have convened governor-appointed climate change task forces to develop recommendations for reducing their greenhouse gas emissions.

Shonto's Shining Example

The Grand Canyon Trust is helping to accelerate the transition from fossil fuels to renewable energy in other ways. Following the closure of Mohave Generating Station, we petitioned the California Public Utilities Commission to cause Southern California Edison to reinvest revenues from the sale of its sulfur credits into renewable energy projects that will benefit Hopis and Navajos. Our request is pending a final decision on whether Mohave's owners seek to reopen the plant.

Meanwhile, Tucson Electric Power has deposited the first of five checks for a million dollars into an account earmarked for offsetting carbon emissions from their new coal-fired unit at Springerville Generating Station. The payments are the result of a Trust-negotiated settlement that resolved our appeal of the plant's permit. The money will be used to establish a renewable energy investment fund to support projects in Native American communities.

One project that may be funded is a mini electrical grid, powered by wind and solar, to serve homes, businesses, and schools in the Navajo community of Shonto, Arizona. For more than two years, the Trust's Native America Program has been helping to develop that remote community's plans for sustainable economic development.

As we left a project review summit late last summer, a heavy rain filled pools of water in sandstone potholes around Shonto. An elder from the community thought that this was a good sign because for generations his family has relied on the pools for drinking water. Roughly translated, "Shonto" means "the place where sunlight shimmers on water." We're hoping that our work with Shonto sets a shining example for redefining how we tinker with tomorrow.

The Colorado Plateau Advocate

. . . is a publication of the Grand Canyon Trust, a non-profit organization dedicated to protecting and restoring the Colorado Plateau

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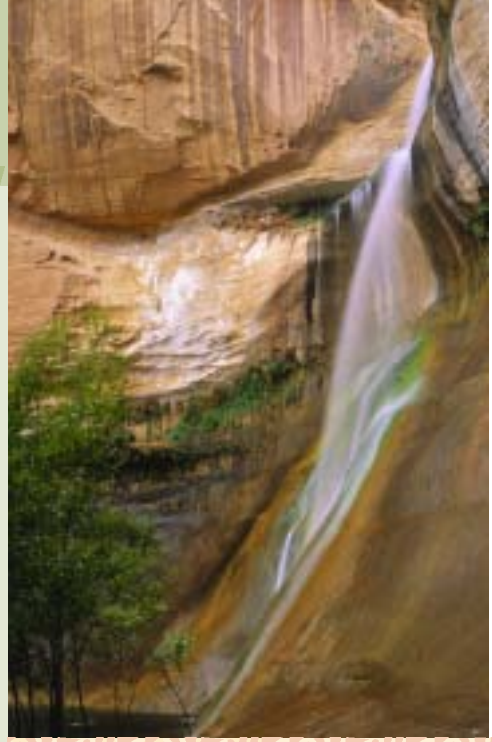

Thanks

The cover photo titled "*Muddy Creek Rainstorm*" in Utah's Mussentuchit Badlands was taken by Michael Collier, a nationally renowned aerial landscape photographer, pilot, and long-time friend and frequent contributor of photos to the Trust. Michael's photos are also seen on pages 2, 5, 7, 17 and this page.

The center spread image *Passage, Purification* (pages 14-15) is a digital composite created by distinguished photographer, filmmaker and artist Victor Masayesva. The photo is from the cover of his recent book *Husk of Time*. Victor, who lives at Hopi in Hotevilla, Arizona, is known for blending traditional photo techniques with digital imaging, drawing, hand-coloring, and collage. Other photos from *Husk of Time* are part of his photo exhibition titled *Drought*, which presents images depicting the Southwest's ongoing drought and its impact on Hopi communities.

Mission

The mission of the Grand Canyon Trust is to protect and restore the Colorado Plateau—its spectacular landscapes, flowing rivers, clean air, diversity of plants and animals, and areas of beauty and solitude.

Vision

We work toward a region where generations of people and all of nature can thrive in harmony. Our vision for the Colorado Plateau one hundred years from now is:

- A region still characterized by vast open spaces with restored, healthy ecosystems and habitat for all native plants and animals.
- A sustaining relationship between human communities and the natural environment.
- People living and visiting here who are willing and enthusiastic stewards of the region's natural resources and beauty.

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